

# SCIENCE

# And Technology Program



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FY 1999 - FY 2001

The research program investigates modifications to trashrack designs that will enhance fish avoidance at canal headworks. The study looks at merging aspects of fish louver technology and debris cleaning in the development of dual purpose structures. Most trashracks operating today were designed solely to prevent debris from entering pump or gravity diversions. This study seeks to incorporate fish exclusion efficiency as a design parameter.

**Problem and Study Summary:** Water diverters and resource managers are interested in technology that combines debris control and affords significant fish avoidance. There is a growing need for better data and design guidelines for dual purpose structures. Debris handling technology and fish louver technology need to be brought together for this purpose. There is a solid background of literature in both areas; however, little has been done to optimize a single structure for both objectives. These types of structures are needed on rivers where protection of native and sport fisheries do not require the high level and extremely costly protection achieved by separate trashrack and fish screen structures. Hundreds of on-river canal inlets exist that have trashracks to trap debris and no formal fish exclusion facilities. Fishery studies conducted near intakes and in canals at irrigation diversions in the Western United States show fish entrainment is a significant problem.

Investigate, develop, and evaluate debris barriers with enhanced fish avoidance capabilities. Develop guidelines for retrofitting typical trashracks with designs that afford better fish avoidance. This research seeks to fill the gap between no fish protection and that of a 100 percent positive barrier fish screen.

In 1999, the research focused on combining trashracks and gradient type electrical fish barriers. Bottom oriented electrical arrays were tested that produce an increasing electrical field as a function of fish penetration. We are investigating the efficiency of this type of fish barrier as a guidance system to move fish away from canal diversions. These types of systems show promise when used where fish have an easy escape route, such as moving across channel.

Studies were also initiated to investigate the behavioral response of fish to trashracks with high sweeping to approach velocity ratios, low sill guide walls, and high velocity bottom sluices. A recent fish louver and headwater structure constructed on the Tongue River, Montana, is being evaluated to determine the effectiveness of low guide walls and bottom sluices in front of trashracks.

Reclamation Montana Area Office, Montana Fish Wildlife and Parks, U.S. Fish and Wildlife Service, Lower Yellowstone Irrigation Project, Tongue and Yellowstone Rivers Irrigation District.

Mefford, Brent W. Lower Yellowstone River Fish Protection and Passage (2nd Draft), January 1999.